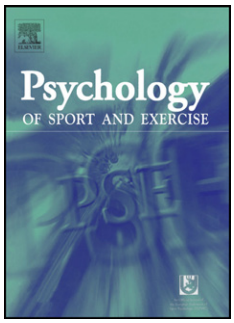


The effects of manipulating goal content and autonomy support climate on outcomes of a PE fitness class

F.B. Gillison, M. Standage, S.M. Skevington

PII: S1469-0292(12)00140-9

DOI: 10.1016/j.psychsport.2012.11.011

Reference: PSYSPO 742

To appear in: *Psychology of Sport & Exercise*

Received Date: 20 January 2012

Revised Date: 5 November 2012

Accepted Date: 5 November 2012

Please cite this article as: Gillison, F.B., Standage, M., Skevington, S.M., The effects of manipulating goal content and autonomy support climate on outcomes of a PE fitness class, *Psychology of Sport & Exercise* (2013), doi: 10.1016/j.psychsport.2012.11.011.

The effects of manipulating goal content and autonomy support climate on outcomes of a PE fitness class.

F.B. Gillison[a], M. Standage[a] and S.M. Skevington[b]

[a] *Department for Health, University of Bath, Bath, BA2 7AY, United Kingdom*

[b] *Department of Psychology, University of Bath, Bath, BA2 7AY, United Kingdom*

Corresponding author: Fiona Gillison

Email: f.b.gillison@bath.ac.uk

Telephone: 0044 1225 384387

Contributing author emails:

M.Standage@bath.ac.uk

S.M.Skevington@bath.ac.uk

Submitted: January 19th 2012

Highlights

- Cluster-randomised controlled trial of a school PE intervention
- Intervention targeting both goal content and autonomy supportive climate
- Controlling conditions and extrinsic goals promote perceived value and intentions
- Challenges to manipulating social environments in schools discussed

The effects of manipulating goal content and autonomy support climate on outcomes of a PE fitness class.

Objectives: The present study tested the potential for manipulating adolescents' goals and motives for participation in a school physical education (PE) lesson, and explored the subsequent outcomes on participant experience.

Design: A cluster randomised controlled design was used to compare outcomes of four experimentally manipulated PE class conditions alongside a control group.

Method: Twenty-four classes comprising 592 students (*M* age = 13.74 years) were randomized to undertake one of four experimental conditions, or a control condition, during a fitness-based circuits class during a usual PE lesson. The experimental conditions comprised an autonomy-supportive or controlling climate, each with an intrinsic (health and fitness) or extrinsic (looking good to others) goal focus. The control condition comprised a neutral climate with no goal focus. The effect of experimental condition on motivational, affective, and intentional outcomes was analysed using hierarchical linear modeling.

Results: Class-level effects explained less than 10% of variance of study outcomes, suggesting that the impact of lesson manipulations was limited. Where intervention effects were significant, these were contrary to hypotheses guided by self-determination theory (SDT), participants perceived greater lesson value and formed stronger future intentions in the controlling, extrinsic goal focused condition. However, at the individual-level, findings were in line with SDT, in that perceptions of autonomy support and an intrinsic goal focus predicted positive lesson-related outcomes (i.e., motivation, effort, enjoyment, value, exercise-induced affect) and future intention to exercise (Total R^2 values = .39 to .75).

Conclusions: The findings highlight the practical challenges of manipulating lesson climates in ecological PE settings.

Physical inactivity in childhood and adolescence is a key concern for public health, linking to a range of chronic disease states in adulthood including diabetes, heart disease and obesity (Department of Health [DoH], 2004). One setting that shows promise for enhancing physical activity in children is school physical education (PE) (e.g., Chatzisarantis & Hagger, 2009; Ntoumanis & Standage, 2009; Taylor, Ntoumanis & Smith, 2009). PE is mandatory in most schools in western nations, and as such provides a setting in which the full range of children's experiences related to physical activity and exercise can be investigated. Moreover, evidence suggests that children's motivation towards school PE can influence their motivation for exercise in general (e.g., Hagger, Chatzisarantis, Culverhouse & Biddle, 2003; Standage, Duda & Ntoumanis, 2003), suggesting that interventions that promote high quality motivation for PE may have useful public health benefits. The present study aimed to test one such intervention designed to enhance motivation towards PE through manipulating both the social context of the class, and children's goals towards a fitness-based PE activity.

A framework of motivation that describes both the relationship between factors within the social environment and motivational consequences, and practical means of influencing motivation is self-determination theory (SDT) (Deci & Ryan, 1985, 1991). According to SDT, motivation falls along a continuum of motivational regulations, from the least to the most autonomous. The prototype of autonomous motivation is labelled *intrinsic* motivation, and is described as motivation driven by its inherent qualities such as interest and enjoyment. At the other extreme, *amotivation* represents an absence of motivation referring to a state in which people lack the motivation to act at all, or act passively. In situations in which non-participation is not an option, such as in mandatory school PE, consequences of amotivation could include disruptive behaviour, devaluing the activity, or students just going through the motions of an activity without engaging with it. Between these two extremes lies *extrinsic motivation*, encompassing motivation towards activities that are undertaken in order to obtain

separable outcomes. Types of regulation within this category include (from the most controlling to the most autonomous); external regulation, introjected regulation, identified regulation, and integrated regulation. Controlled forms of extrinsic motivation are considered to be driven by external contingencies such as reward, coercion, and punishment (i.e., external regulation), or through partly internalized reasons such as guilt, ego-enhancement, pride or shame (introjected regulation). More autonomous forms of regulation relate to acting through personally valuing an activity (identified regulation), or acting to be consistent with one's sense of self (integrated regulation).

SDT provides a useful framework for applied work as it draws on a large body of empirical evidence that links a number of malleable factors within the social environment to the promotion of more autonomous functioning. A number of practical strategies have been documented that can be used to help people to adopt activities that are not intrinsically interesting to them through autonomous regulations, effectively moving along the motivational continuum through the process of *internalization* (cf. Deci, Eghrari, Patrick & Leone, 1994). A central and unifying construct within SDT relates to the degree to which the social context and/or interpersonal interactions satisfy three basic psychological needs; autonomy (i.e., a person's need for agency and endorsement of their behaviour), competence (i.e., the need to interact effectively within the environment), and relatedness (i.e., a need to feel that one is connected to, and cared for by others) (Ryan & Deci, 2000). Past work in PE settings has demonstrated that children who perceive support for these needs from their teacher show greater need satisfaction (i.e., they are responsive to a particular climate) (e.g., Standage, Duda & Ntoumanis, 2005). Further, need satisfaction has been linked to teacher ratings of children's effort and persistence in PE (Standage, Duda & Ntoumanis, 2006). Other elements of the social environment that have been identified to promote internalization include (a) the provision of a credible rationale of why the activity is important, (b)

acknowledgement that the activity is not inherently interesting (i.e., showing empathy and/or taking the other's perspective) (Deci et al., 1994), (c) provision of structure (i.e., clear instructions and information) (Jang, Reeve & Deci, 2010) , and (d) informational feedback (Deci, Ryan & Williams 1996; Koestner, Ryan, Bernieri, & Holt, 1984). The provision of structure by the teacher and the degree to which children feel them to be involved/interested in lessons has been found to predict motivation for school PE (Taylor & Ntoumanis, 2007).

While there is evidence to suggest that the observed teacher-led PE climate is associated with student experience and behaviour, few studies have investigated how this can be successfully manipulated. Most available research reports on practical ways to support autonomy. For example, effective autonomy supportive teaching styles include; offering enhanced choice of activities, acknowledging difficulties or barriers to participation (e.g., Chatzisarantis & Hagger, 2009), nurturing inner (e.g., sense of challenge) rather than extrinsic (e.g., incentives) motivational resources, and using non-controlling language (e.g., "you can choose to" rather than "you should, you must") (Jang et al., 2010). However, other observational work suggests that the link between teacher behaviour and student perceptions may not always be so clear cut; in a large scale study involving 51 teachers and 787 students, teachers' and students' perceptions of the autonomy support and structure provided in same classes were not related (Taylor & Ntoumanis, 2007). Intervention studies to explore this further have been called for (Ntoumanis & Standage, 2009).

Few studies report on techniques implemented to support the psychological needs other than autonomy. Available research investigating how to promote competence has been conducted through providing informational feedback and encouragement, demonstrating required skills/tasks, and introducing self-monitoring (e.g., Mata et al., 2009; Williams et al., 2006). Relatedness has been supported through promoting co-operative environments that

foster social support and demonstrating interest in people as individuals (e.g., Sheldon & Filak, 2008).

Self-determined motivation is not only predicted by need supportive climates, but may also be influenced by the content of behavioural goals (Deci & Ryan, 2000; Kasser & Ryan, 1996). From an SDT perspective, an individual's goals (or "what" they aspire to get out of a given activity) have been broadly categorized as intrinsic (stemming from a person's core values), or extrinsic (attainment of separable goals from the activity itself) (Kasser & Ryan, 1996). The goals of health management, social affiliation, and skill development have been characterized as intrinsic goals, and image, attaining status, and improving appearance as extrinsic goals (Furnham, Badmin & Sneade, 2002; Sebire, Standage, & Vansteenkiste, 2008; Vansteenkiste, Simons, Soenens & Lens, 2004b). Intrinsic goals are hypothesized to result in the satisfaction of basic needs, whereas extrinsic goals are inconsistent with need satisfaction. Although goal content and motivation are often closely linked through their association with need satisfaction, some studies have found an independent effect on outcomes as a result of goal content, in addition to the effect on outcomes of motivation (Sheldon, Ryan, Deci & Kasser, 2004; Vansteenkiste et al., 2004b). Consequently, goal content may be important in determining the cognitive, behavioural, and affective consequences of behaviour (Deci & Ryan, 2000; Standage & Ryan, 2012). Within exercise settings, independent effects have been reported for relative intrinsic goals and motives on indices of well-being (e.g., better well-being, less anxiety, greater physical self-worth) but not on either reported or objectively assessed exercise behaviour (Sebire, Standage & Vansteenkiste, 2009, 2011).

Goal framing is inextricably linked to the process of providing a rationale for activities (a necessary component of an autonomy supportive climate), as by outlining why a person may wish to take part effectively highlights the potential goals available. For

example, teachers may explicitly state that students should engage in a task as it is part of an exam curriculum, thereby emphasizing an extrinsic goal of attaining external rewards, or they may present the same task by referring to a more intrinsic goal, such as self-development or helping others. Although the goal content endorsed within a rationale provided as a means to establish an autonomy supportive climate may thus be important, it has so far attracted little attention in PE settings (Sebire et al., 2009, 2011; Standage, Gillison & Treasure, 2007).

Previous applied research investigating the effects of manipulating goal content in broader education settings has primarily focused on the role of goal content in adopting new behaviours and/or novel activities (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004b). In these examples, simple written scripts framing a lesson on a single occasion were distributed and read by students before they started a task (Vansteenkiste et al., 2004b). It was notable that even such a brief intervention proved sufficient to bring about a significant and positive change in motivation after 4 months; differences of a large effect size were reported between intrinsic and extrinsic goal framing for intrinsic, identified and external regulations, and a large effect size in persistence (involvement in skill demonstration) (Vansteenkiste et al., 2004b). However, it is also of importance to study whether manipulating goal content can bring about similar effects on existing behaviours; that is tasks and activities for which children may have existing goals and motives. In the case of physical activity and exercise, it is the drop-out of adolescents from their higher childhood levels of physical activity that is problematic for adolescent health rather than the failure to adopt new behaviours (DoH, 2004). Therefore, in the present study we sought to investigate the feasibility and efficacy of manipulating goal content for PE through a brief, scripted intervention similar to those found effective for novel activities. Accordingly, this work extends past observational research by applying existing goal manipulation techniques to the pursuit of existing behaviours.

In line with theory and past work, it was predicted that positive motivational, affective and intentional outcomes would be promoted by autonomy supportive lesson climates, but that these effects would be undermined when the goal content promoted was extrinsic (Deci & Ryan, 2000). Additionally, as providing a meaningful rationale is proposed to be central to the internalization of motivation (Deci et al., 1994), promoting any goal (i.e., intrinsic or extrinsic) was predicted to result in more evidence of internalization of the behaviour than the absence of a goal/rationale. In the light of past work that suggests children's sensitivity to teacher behaviour may not be sufficiently robust to detect these changes (Taylor & Ntoumanis, 2007), a range of dependent variables were included to reflect a broad spectrum of outcomes predicted to result from autonomous motivation. These included immediate responses to the lesson indicative of the internalization of behaviour (specifically; value, exercise-induced affect, and enjoyment), motivational regulation, and measures of perceived effort and intention to join a similar activity in future (e.g., Vansteenkiste et al., 2004b).

Method

Participants

The sample frame for the present study was mid-adolescent students (aged 13-15 years) attending UK schools. Head teachers of co-educational state-run secondary schools within two local education authorities were approached sequentially from a published list and invited to participate until the target sample size was achieved. All students within a single year group (Year 9) were eligible to participate.

Design

A cluster-randomised controlled design was used to compare outcomes of four different experimentally manipulated PE class conditions alongside a control group. The study was conducted within an ecologically valid setting (i.e., the students' usual PE class), and the

exercise content of each lesson was the same; conditions only differed in the instructions given. The rationales presented to students was directly adapted from scripts used in previous studies (Vansteenkiste, Simons, Lens, Sheldon & Deci, 2004a) (see Appendix 1 for examples) and checked for the appropriateness of the vocabulary by a school teacher.

The five conditions were; (1) autonomy supportive, intrinsic goal content, (2) controlling, intrinsic goal content, (3) autonomy supportive, extrinsic goal content, (4) controlling, extrinsic goal content, and (5) neutral climate, no goal content provided (control group). In line with past work, the intrinsic goal content condition emphasized the goal of staying physically fit and healthy, and the extrinsic goal content condition emphasized the goal of appearing physically attractive, looking good to other people, and avoiding weight gain (Furnham et al., 2002; Vansteenkiste et al., 2004b). For the manipulation of the social context (i.e., autonomy support, controlling, and neutral control), we adapted content directly from Vansteenkiste and colleagues' scripts (2004a) to include phrases such as "*we are asking*" and "*you can choose*" in the autonomy-supportive conditions, compared with "*you should*" and "*you have to*" in the controlling conditions. Purely factual information with no rationale was given to the control group ("*This PE lesson will take the form of a circuit of activities. There are 10 stations with different activities*…"). We chose a fitness-based circuits class firstly as students take part individually so are not reliant on others to take part at a chosen level of intensity, and secondly to study the effects of goal framing on an activity that adolescents are directed towards by others (i.e., take part in through extrinsic regulations) rather than one that they are intrinsically motivated towards. This is necessary to study the processes of internalization. Teacher and pupil consultation ahead of the trial confirmed fitness-based classes were the least inherently enjoyed of a range of different PE activities.

Measures

It was anticipated that a child's motivation towards an individual PE lesson (i.e., situational level) would be at least in part underpinned by their usual motivation towards PE (i.e., contextual level), as set out in the Hierarchical Model of Extrinsic and Intrinsic Motivation (HMIEM;Vallerand, 1997). Therefore, one week prior to the intervention (T1), baseline contextual level measures were recorded to allow for the control for these factors. Immediately prior to the intervention (T2), situational affect was measured to allow for a pre-post assessment of the affective impact of the lesson. Following the intervention (T3), participants completed a final questionnaire containing the main outcome measures relating to motivation, affect and cognitions, plus items providing a manipulation check to assess whether each condition had been perceived by participants as intended.

Baseline variables (T1)

Contextual motivation towards PE: The 20-item Perceived Locus of Causality scale (PLOC; Goudas, Biddle, & Fox, 1994) was used to assess five sub-types of behavioral regulation set out within SDT (i.e., amotivation, external, introjected, identified and intrinsic regulation). Responses to the PLOC items are provided on a 7-point Likert scale, labeled from 1 (*strongly disagree*) to 7 (*strongly agree*). Adequate internal consistency (Lonsdale, Sabiston, Taylor & Ntoumanis, 2011) and discriminant validity (Caldwell, Baldwin, Walls & Smith, 2004) has been demonsrated for the PLOC with adolescent samples.

Perceived autonomy support: Perceptions of autonomy support from the teacher during PE was measured using a PE-modified six-item version of the Learning Climate Questionnaire (LCQ; Williams & Deci, 1996). Items are recorded on a 7-point Likert scale labeled from 1 (*strongly disagree*), to 7 (*strongly agree*). The adapted version of the LCQ has been shown to have good internal consistency ($\alpha = .92$) and to be predictive of need satisfaction and affect in a school-aged sample (Standage et al., 2005).

Pre-intervention measure (T2)

Exercise-Induced Affect: The 12-item Exercise Induced Feelings Inventory (EFI) (Gauvin & Rejeski, 1993) was completed before and after the lesson to evaluate change in mood and vitality as a result of the intervention lesson. Although designed for use after exercise, the items can be completed prior to exercise as they measure, for example, the degree to which respondents feel fatigued, energetic, happy, tired, relaxed, etc. Item responses are recorded on a 5-point Likert scale labeled from 0 (*do not feel*), to 4 (*feel very strongly*). The EFI has been reported to have acceptable internal consistency and factor structure when used with children (α = .58, .69, .72 and .72 for the subscales of positive engagement, revitalization, tranquillity and physical exhaustion, respectively; Vlachopoulos, Biddle & Fox, 1996).

Outcome variables (T3)

Intrinsic Motivation Inventory (IMI) Two subscales from the IMI (McAuley, Duncan, & Tammen, 1989) were used to measure students' (i) interest and enjoyment of the lesson, (ii) the value they placed on the activity. Each subscale consists of seven items, scored from 1 (*not at all true),* to 7 (*very true).* When used individually, the subscales have shown good discriminant validity between adolescents in conditions of high or low autonomy-support (Goudas & Biddle, 1994), and predict adolescent involvement in physical activity over time (Papaioannou, Bebetsos, Theodorakis, Christodoulidis & Kouli, 2006). Acceptable internal consistency (α = .93) has previously been reported with student samples for the interest and enjoyment subscales (Wang, Liu, Lochbaum & Stevenson, 2009).

Situational motivation; Situational motivation (i.e., motivation for this particular PE lesson) was measured using the 14-item version of the Situational Motivation Scale (SIMS) (Guay, Vallerand & Blanchard, 2000) adapated by Standage, Treasure, Duda, and Prusak (2003). Items are recorded on a 7-point Likert scale labeled from 1 (*not at all*), to 7 (*exactly*).

Internal consistency (α = .85, .78, .82 and .92 for amotivation, external regulation, identified regulation and intrinsic motivation, respectively) has been demonstrated in a large UK adolescent sample (Lonsdale et al, 2011), and support for the factorial validity of the SIMS has been reported within physical activity settings (Standage et al., 2003). As the SIMS does not include a scale relating to introjected motivation, the introjected motivation subscale from the PLOC was adapted (i.e., from "*I take part in PE because …"* to *"I took part in this PE class because…"*). Cronbach's alpha for this adapted scale was .79.

Future intention to exercise: Intention to exercise in the future was measured using a single item; "We are looking at the possibility of running some optional circuits classes like the one you have just done, in lunch times or after school. Would you be interested in joining something like this?" Participants recorded their responses on a 7-point Likert scale labeled from 1 (*not at all interested, I definitely wouldn't try it*) to 7 (*extremely interested, I would definitely want to take part*).

Effort: Effort was measured using the effort subscale of the IMI (McAuley et al., 1989). Items are recorded on a 7-point Likert scale labeled from 1 *(not at all), to 7 (very much).* This measure has previously been found to be reliable (Papaioannou et al., 2006) and to have adequate internal consistency (α = .80; Taylor & Lonsdale, 2010) in adolescents.

Manipulation checks

Students' perception of autonomy-support from the instructor was measured using the six-item version of the LCQ (as used at T1), modified to refer to the instructor of that specific lesson. Perceived goal focus was measured through three items targeted at each goal condition. That is, we used the same approach employed in past experimental work (Standage, Duda & Pensgaard, 2005). Example items of the amended measure include; "*the main focus was to improve my health and fitness"*, *"there was no particular focus as to what*

I should get out of this lesson" and *"the focus was to help me to stay slim and look better"*. Participants responded on a 7-point Likert scale labeled from 1 (*not at all),* to 7 (*extremely*).

Procedure

Institutional ethical approval was obtained before commencing the research, and letters were sent home to parents providing information and seeking passive consent. As PE was conducted in single sex groups in all schools, classes were stratified by gender prior to randomization. Individual class groups were then randomized (without replacement) to a condition by an independent researcher. Neither students nor their teachers were aware of the condition to which they were allocated, nor of the details of the differences between conditions. Students who opted out of the study could chose to participate in parallel PE classes (where available), or join in with the lesson content without completing the accompanying evaluation. This ensured that no student missed out on a timetabled PE lesson as a result of not wishing to take part in the research.

At the start of experimental lesson, participants first completed the T2 measures, following which a script was read by the investigator framing the aim of lesson according to randomisation. The investigator then demonstrated each individual activity using wording consistent with an autonomous (e.g., "you can", "you could") or controlling ("you must", "you should") condition. In addition, students in the autonomous condition were told that they could choose who they worked with and which activities they engaged in (so that they could construct their own circuits program), which station to start at, and asked to rotate in a clockwise fashion between the stations[1]. Participants were informed that they could also choose to take a break at any time if they needed to, as the aim of the session was simply "to try their best". Students in controlling conditions were allocated to groups and stations, informed that they must complete all stations in the correct order, and told that they had to continue exercising until the whistle signalled for them to stop. The class then began with a

brief warm-up, followed by a circuit of 10 activities that alternated 30 seconds of activity with 30 seconds of rest. A two minute break was provided half way through the lesson at which point the participants were reminded of the lesson goal content in the appropriate autonomy-supportive/controlling manner (e.g., "*Remember that to get the most out of this session in terms of your health and fitness...*").

The session was delivered by the same investigator on all occasions, and the content of interactions with the students was consistent at all times with the experimental condition. Instructions were read exactly as they appeared in the script at the start of the lesson and at the half way point. The investigator running the trial had 10 years of experience in working with children in a school setting through delivering educational sessions and conducting research, but was not a trained PE teacher. Students' usual PE teachers were present on each occasion to comply with school policy, but were provided with a distraction task and requested to avoid any interaction with the students during the lesson. Their presence also ensured that students maintained reasonable levels of behaviour; one class of boys was excluded as disruptive behaviour meant that the protocol could not be correctly and clearly implemented, but all other class groups attended to, and complied with the protocol. At the end of the class, participants completed post-session questionnaires (T3), taking approximately 10 minutes. Following the sessions the researcher took field notes to record any variation from protocol such as intervention by school teachers, and levels of compliance/engagement for assistance in the interpretation of results.

Data Analysis

The data were analyzed via hierarchical linear modeling using HLM 6 (Raudenbush & Bryk, 2002), which allowed group-level effects resulting from a particular class environment to be accounted for. Unconditional models were first computed to establish the amount of variance explained at the class-level (ICCs). The full effects models included contextual motivation

and usual autonomy support during PE as control variables at Level 1 (student level), and control variables of gender (as classes were run in single gender groups), class size and time of day at Level 2 (class level). In line with recommendations, Level 1 variables were group-centred, and the Level 2 variable of class size grand centred (Raudenbush & Bryk, 2002). For ease of interpretation the intercept for experimental condition was set as 0 for the control group (Raudenbush & Bryk, 2002). Thus, the intercept represented the value of the dependent variable expected for a participant in a neutral climate, goal-content free condition.

Results

Descriptive Statistics

The final sample comprised 592 participants (*M* age = 13.74 years, SD=.30; range 13.1 to 15.0 years, 45% male, >93% of white British origin), nested within 24 class groups. Participants were drawn from six comprehensive schools based in small towns in south west England, ranging in size from 1050 to 1653 students. Three schools served populations slightly above the national average for socio-economic status (SES), two slightly below, and one average. Between two and eight classes were run in each school, with class size ranging from 8 to 34 students (*M* = 27, SD=5.24, median = 28). Following randomization, six classes were run for each experimental condition except for the autonomy supportive, goal content condition, which had five classes. Three control group classes were run. Progress of participants through the study is shown in Figure 1.

Figure 1

Manipulation check

A manipulation check was conducted to test the between group-differences of students' perceptions of the lesson climate and goal focus (ANOVA with *post hoc* Bonferroni tests) (Table 1). A significant univariate effect was found in the anticipated directions for both

extrinsic goal content and perceived autonomy-support indicating that that the students perceived these two manipulations as intended. However, the manipulation of intrinsic goal content was unsuccessful as perceptions of these goals were no higher in the intervention group than in the control (no-goal) condition, and were highest of all in one of the extrinsic goal content conditions.

Table 1

As the manipulation of the intrinsic goal content condition was unsuccessful, we will continue to refer to this condition as the *attempted* intrinsic goal condition. Students in this condition still had a different experience from the control group, as a goal (and therefore rationale for the activity) had been presented to them. However, this term is intended to acknowledge that the intervention did not result in students perceiving a stronger intrinsic goal focus than in other conditions.

Main results

The mean values of the outcome variables for each group are set out in Table 2.

Table 2

ICCs showed that less than 10% of the variance was explained at the class level, suggesting the impact of experimental condition (one of the class-level effects) was limited (Table 3).

Table 3

There was no significant effect of class group (and thus experimental condition) on motivation or exercise-induced affect (*t*-ratio = 1.8 and .17, respectively). Only perceived lesson value and future intentions were influenced by experimental condition. *Post hoc* tests indicated that the effect of experimental condition on these variables was not in the direction predicted; participants awarded the highest value rating for the controlling, extrinsic goal content condition (M = 5.02, SD = 1.57), and lowest for the controlling, (attempted) intrinsic goal content condition (M = 4.33, SD = 1.56). Similarly, future intentions were highest in the

controlling, extrinsic goal content condition (M = 4.44, SD = 2.07), and lowest in the autonomy supportive, (attempted) intrinsic goal content condition (M = 3.79, SD = 1.66). Effort was significantly influenced at a group level, but only as a result of the time of day; students taking part in classes held earlier in the day contributed greater effort. None of the explanatory variables explained class differences in lesson enjoyment.

The low ICCs indicated that greater explanatory power may be provided at the individual rather than group level. Given that theoretically unexpected findings were reported at the group level, *post hoc* tests were conducted to establish whether these were also evident at an individual level; this was undertaken to assist in establishing whether the findings were an artefact of research design (which could be inferred if the individual level effects were consistent with theory) or a true challenge to theory (which could be inferred if individual level effects also departed from theory). A *post hoc* hierarchical linear regression analysis was therefore conducted using Level 1 variables only (Table 4). Gender and baseline variables (i.e., contextual motivation and autonomy support for PE) were entered as a first step, with individual perceptions of lesson climate and goal as a second step.

When baseline variables were controlled for, perceived intrinsic goal focus (i.e., health) was a significant positive predictor of all outcomes (β = .17 to .27), perceived autonomy support was significantly and positively predictive of all outcomes except for exercise-induced affect (β = .10 to .31), and perceiving no goal for the lesson was negatively predictive of all outcomes except for affect and enjoyment. These findings were in line with theoretical predictions. Perceiving a focus for weight management (i.e., the extrinsic goal focus) was unrelated to any outcome, and there were no significant goal by motivational climate interactions.

Table 4

Discussion

The purpose of the present study was to assess whether framing PE lessons in terms of the goals students could expect to achieve from taking part (i.e., goal framing) would have an additional impact on motivational and intentional outcomes to that of the social context (i.e., autonomy-supportive or controlling climates). Whereas previous studies have reported on the utility of goal content and autonomy-support in the adoption of new behaviours (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004a), the present study was designed to provide a test of these relationships in promoting existing activities in the ecological context of mainstream school PE classes. The fact that our findings did not confirm theoretical hypotheses is important in challenging our assumptions, and raising issues for practice and research. Indeed, the data provide a basis from which to build, refine, and elaborate on in future work.

Our manipulation check confirmed that perceptions of extrinsic goals for PE were positively influenced by the delivery of a brief pre-lesson script (repeated at the lesson mid-point), however no change was brought about in students' perceptions of an intrinsic goal focus. Previous short-term and lab-based research has reported such scripts are sufficient to at least temporarily change perceptions in both children and adults when presented ahead of a new activity (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004b). As such, the lack of significant findings in the present study suggests that perceptions of environments that are experienced regularly (as opposed to novel environments) may change at a slower pace. It is also possible that some of the difference between the present study and similar work may stem from the different method of delivery, as information was received aurally rather than in written form. Written instructions, or those delivered individually rather than to a group, may have a greater impact, or encourage deeper processing and engagement.

Given that intrinsic goal content was not successfully manipulated, it is more appropriate to conceptualize the findings as a comparison of the effects of enhancing an

extrinsic goal focus relative to no additional extrinsic goal focus, both in the presence of a pre-existing intrinsic goal. As the ICCs calculated ranged from only 1% (intention) to 6% (motivation), it must be concluded that experimental condition had little effect on the outcomes measured. Indeed, experimental condition was only predictive of perceived lesson value and future intentions, but in both cases students reported the most positive outcomes from the controlling, extrinsic goal condition.

While these findings are contrary to the tenets of SDT, they do not completely contradict findings from previous applied research (Niemiec, Ryan, & Deci, 2009a; Sheldon et al., 2004; Vansteenkiste et al., 2004b). For example, Vansteenkiste et al. (2004b) reported better persistence over four months for school children learning a new sport following extrinsic goal framing relative to no goals, although the outcomes were not as strong as for those oriented towards intrinsic goals. Similarly, pursuing personally important intrinsic and extrinsic goals were equally predictive of goal attainment (e.g., led to similar effort) in college leavers (Niemiec et al., 2009a). The present study therefore suggests similar short-term effects may be achieved through promoting extrinsic goals for an existing activity. This said, as research documents the negative implications for exercise-related outcomes as a function of ongoing extrinsic pursuits (cf. Standage & Ryan, 2012), future work would be valuable in studying longer term effects.

In the present context, the specific extrinsic goal of physical appearance that was used represents a personal attribute that adolescents value highly (Furnham et al., 2002; Smith, 2003). As such, it would be expected that students would continue to value it even if presented in a controlling manner, and that motivation for this goal could become partially internalized (i.e., via self-esteem-related contingencies such as ego and pride of looking good to others, or the shame of not looking good). This was supported by the fact that the promotion of extrinsic goals led to higher perceptions of lesson value. However, as it has been shown that exercise-related extrinsic goals do not lead to need satisfaction (e.g., Sebire et al., 2009), it is unlikely that motivation would be further internalized. As such, positive behaviour-related outcomes will be short lived (Gillison, Standage & Skevington, 2011; Pelletier, Fortier, Vallerand & Briere, 2001). It would be interesting for future research to build

on cross-sectional work to examine the ongoing behavioural, well-being and exercise experience of those pursuing *and* attaining extrinsic goals. The differences in outcomes attained for extrinsic goals when in the absence, rather than the presence of intrinsic goals (as was apparent in the present study) also warrants further investigation.

Past findings have also reported short-term activating effects on behaviour and performance in response to exposure to controlling contexts (e.g., Grolnick & Ryan, 1987). However, such work shows that learning/performance in controlling situations is rigid and superficial (i.e., as indexed via rote learning), and less likely to be maintained (Grolnick & Ryan, 1987; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). That is, although motivating in the short-term, controlling contexts are not conducive to supporting high 'quality' motivational engagement. Further, it may be that rather than being detrimental to perceived autonomy, the presence of controlling behaviour from teachers simply has no effect as long as at least some autonomy support is present. This has been demonstrated in a recent intervention study in which PE teachers were successfully trained to exhibit more autonomy supportive teaching styles, and this resulted in an increase in students' perceptions of autonomy support despite the persistence of some controlling teaching methods (Tessier, Sarrazin & Ntoumanis, 2010). In the present study, the perception of autonomy support may have been present to some degree in all conditions as a result of adhering to ethical guidelines to ensure all students understood that they were not obliged to take part. Future work exploring the effects of different control-related inductions would be informative.

There are several possibilities as to why participants in the present study did not thrive in the autonomy-supportive conditions as predicted. These are evidenced by the individual level effects and the investigator's field notes. Debate in the SDT literature suggests that choice is only perceived to support autonomy if it is perceived to be a true choice, without implicit control (see Ryan & Deci, 2006, pp. 1575-1577 for a discussion). Teachers were present throughout the session which may have affected whether students felt real freedom to

stop and start when they liked. Students were given the freedom to split themselves between stations, however in doing this in a way which avoided confrontation with other students may have provided an implicit sense of control (Ryan & Deci, 2006). Further, too much choice with insufficient structure can undermine motivation and positive outcomes such as vitality, through ego-depletion (Moller, Deci & Ryan, 2006).

The provision of structure was attempted in the present study through explanation of the lesson format and timings of different sections, and demonstration of activities at each exercise-station. However greater structure could have been provided through increasing student understanding of the relative contribution of different fitness activities to overall fitness, or necessary work-rates for health benefit. This would have provided greater information and support to help them to plan a meaningful route through the activities. Indeed, the presence of apparent structure in the controlling condition may be a confounding issue that may help to explain the unexpectedly positive findings for this condition; that is, participants may have responded positively to the structure (e.g., clear instructions and information regarding who to exercise with, for how long, and in what order etc.), rather than negatively to the control that they experienced. This suggestion fits with the individual level results that show that perceived control itself was not associated with more positive outcomes. Similar to past field-based work in PE (e.g., Vansteenkiste et al., 2004b), we relied on our experimental inductions and as such perceptions of a controlling climate and perceived structure were not explicitly assessed. The omission of these pertinent items is a limitation of the study. It would be useful in future to quantify the level of choice and objective markers of autonomy-support that are necessary to provide adolescents with a sense of authentic choice, within structured contexts.

Finally, although research shows situational responses to be sensitive to interventions taking place in a single ‘novel’ exercise-based session (e.g., Standage et al., 2005), such a

brief intervention may be insufficient to overcome an existing mind-set inclusive of both goals and motives. Recent research by Cheon, Reeve, and Moon (2012) supports this reasoning, by showing the benefits of an ongoing autonomy-support intervention. In this research, results of repeated measures ANCOVAs showed that student need satisfaction and reported adaptive outcomes increased in line with PE teacher autonomy-support, and importantly that there were marked improvements in reported gains over time. This suggested that students benefit from repeated interactions with teachers versed in the techniques deemed to be autonomy supportive (Cheon, Reeve & Moon, 2012). Drawing from Vallerand's hierarchical model of motivation (Vallerand, 1997), it would therefore seem that responses to the PE experience are influenced by contextual level experiences (i.e., usual experience and expectations), and thus may take more than a single lesson to influence.

Post-hoc individual level analyses

Post-hoc regression analyses were conducted to explore whether the unexpectedly positive outcomes for controlling and extrinsic goal content conditions at the class-level were mirrored at the individual level. This was not the case; individual level findings were consistent with theoretical predictions (i.e., SDT), in that stronger perceptions of an intrinsic goal (i.e., health) focus to the lesson and autonomy support were related to better outcomes for all dependent variables. Such findings corroborate the results from observational studies in PE settings that report the predicted links between children's perceptions of PE lesson climate and lesson outcome (see Standage et al., 2007), but no association between teacher's reported provision of autonomy support and student perceptions of this (e.g., Taylor & Ntoumanis, 2007). It was notable that perceptions of an extrinsic goal focus of the lesson were not significantly related to study outcomes. The lack of an individual response to increased perceived extrinsic goal content may help to explain the lack of class-level effects, as even though extrinsic goal focus was successfully manipulated it did not appear to

influence the outcomes. Thus, it may be that the more positive effects on value and intentions found in extrinsic goal conditions were not reflective of the manipulation of these goals, but other characteristics of their experience in this condition. This could be having a greater number of goals, or perceiving a stronger rationale, regardless of its content.

Limitations

The potential for manipulating the social context within the present study was only tested within a single PE lesson, and different results may have been obtained if this approach had been sustained. Recent work examining autonomy support suggests that repeated manipulations of PE lesson goal content to the same cohort of students is needed to bring about greater congruence in perceptions of lesson content among pupils (Cheon et al., 2012). In addition, while it was a strength of the study in terms of consistency that all intervention sessions were delivered by the same researcher, as this was not the students' own PE teacher this reduced ecological validity. This said, students are often taught by teachers not previously known to them (e.g., supply or temporary teaching staff), as well as initial sessions with timetabled staff. Although the researcher was experienced in working with children in a school setting (both in conducting research, and delivering educational activities), she was not a trained PE teacher. Lastly, more objective information could have been gathered to confirm that the researcher delivering the lesson adhered to the protocol and lesson scripts. While the authors are confident in the fidelity of the implementation of each session to the protocol as an exact script was read out in each lesson, a rating protocol similar to that used by Cheon et al. (2012) may have helped to confirm this.

Measurement of perceptions of goal focus was also a limitation. Despite advances in the measurement of exercise goals with adult populations (e.g., Sebire, Standage & Vansteenkiste., 2011), to date no valid measures of goals that adolescents hold for exercise/PE are available. We therefore measured perceptions of the intended focus of the

lesson rather than attempting to assess an individual's own reported goals, but this may have tapped students' implicit interpretations as to the purpose of PE rather than whether or not they themselves endorsed these goals. As such, the instrument may have had limited sensitivity and therefore restricted our ability to detect change. Furthermore, although weight control was carefully promoted as an external goal (i.e., to be undertaken in order to look good to others), it could have been construed as an intrinsic goal (i.e., in order to maintain a healthy weight) to adolescents who already held that view. That is, health-related information is so deeply embedded in the tasks that we asked the participants to do, that it would be hard to promote 'clean' extrinsic goals (or a true goal-free session) in this context. Lastly, a challenge for researchers attempting to use control groups in goal-related work is that it may be that a person's relative goal content (intrinsic/extrinsic) rather than strength of either goal that is important. A situational goal content measure is called for that would allow more accurate measurement of adolescents' goals and allow for the control of relative goal focus.

In relation to measurement issues, the impact of the experimental manipulation on motivation may have been better measured by two situational motivational measures (i.e., one taken following a usual PE lesson, and one taken following the research lesson). In the present study, a comparison was made between a situational measure of motivation following intervention, and a contextual measure at baseline.

Conclusions and future directions

Previous work has identified school PE as a useful setting from which to promote wider exercise participation to adolescents (e.g., Hagger et al., 2003; Standage et al., 2003). The present findings were aligned with SDT in showing that at an individual level, students' perceptions of the autonomy support provided by their teachers, and perceiving the activity to be directed towards an intrinsic goal were both facilitative of motivation and positive affective / intentional outcomes. However, the degree to which these perceptions could be

manipulated as intended through a pre-lesson script was limited, and the outcomes of such manipulations resulted in results that were contrary to expectations and past work. These findings suggest that adolescents' goals towards existing activities are less open to change through scripted goal-framing than are goals towards new activities.

The finding that there was some advantage to adolescents experiencing a controlling lesson style that also emphasized extrinsic goals is consistent with previous work that demonstrates that possessing and striving towards personally valued extrinsic goals can lead to equivalent goal attainment as striving for intrinsic goals, even if they do not lead to equivalent wellbeing benefits from their attainment (Niemiec, Ryan, Deci & Williams, 2009b). The present study extends this analysis to suggest that in the presence of adequate intrinsic goals for PE, additional extrinsic goals towards health-related outcomes may increase the value that students attribute to the lesson, which has the potential to promote the process of internalization. However, it is important to note that theory and empirical work suggest that these positive outcomes would not be expected to persist (Ryan & Deci, 2000). Further, it is acknowledged that under the present study design the controlling conditions also provided a large degree of structure to participants, which, as a key element of autonomy supportive environments, may have contributed to the positive outcomes reported.

Building on the present study, future work would be useful in assessing the effect of promoting intrinsic goals other than health and fitness to students. It may be that more novel and immediately meaningful goals than the more distal goal of health are required to engage an adolescent population (i.e., health may not be a salient goal in healthy and young participants). If such novel goals within the PE setting can be identified (e.g., challenge, enhanced well-being, mastery of the environment, etc), there may be greater potential to enhance motivation through increasing the number of intrinsic goals an adolescent may

perceive; or providing at least one relevant and meaningful goal to a greater proportion of young people.

Exploring the outcomes of different climates on objectively assessed student effort and behaviour during PE lessons would also provide further insight into the importance of these factors. Past work has reported an association between observed levels of self-determined motivation and effort in PE measured through pedometers (Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009) and accelerometers (Aelterman et al., 2012), and it would be insightful to apply these outcome measures to assess whether the effects of manipulating lesson climate and goal content are sufficient to bring about objectively measurable effects. Qualitative work involving adolescents themselves in the process of understanding the range of intrinsic goals that are conductive to need satisfaction would be well placed to achieve this. It would also be useful to develop different means of manipulating goals beyond the delivery of scripts that frame activities, as it is plausible that stronger methods are necessary to overcome existing goals and motives than are required for new activities. Finally, further work is warranted explore the objective differences in levels of autonomy-support necessary to obtain similar levels of need satisfaction for children, adolescents and adults.

In conclusion, at an individual level the present study showed that students perceiving autonomy support from an instructor, and retaining intrinsic goals for a PE class obtained better outcomes from the session. Furthermore, there appeared to be a short-term advantage to perceiving additional goals for the lesson, even if these goals were extrinsically focused. Contrary to theoretical predictions, motivation and outcomes were not undermined in controlled environments, perhaps as students valued the additional structure that these provided within a school context where higher levels of control are considered more legitimate than in other life domains. The present study highlights the difficulty of manipulating the social context and goal focus for familiar activities; in contrast to previous

research showing that one-off classroom-based interventions using written goal framing scripts are sufficient to influence children's goals for new activities, our study found that a verbal script had only limited influence on students' goals and motives for an existing activity within a single PE lesson.

Footnotes

1 Greater structure was added to the autonomy supportive condition (i.e., suggesting clockwise movement through stations rather than complete free choice) following pilot testing that showed that complete free-choice was found to be confusing/undesirable.

References

Aelterman, N., Vansteenkiste, M., Van Keer, H., Van den Berghe, L., De Meyer, J., & Haerens, L. (2012). Students' objectively measured physical activity levels and engagement as a function of between-class and between-student differences in motivation toward physical education. *Journal of Sport & Exercise Psychology, 34*(4), 457.

Caldwell, L. L., Baldwin, C. K., Walls, T. & Smith, E. (2004). Preliminary effects of a leisure education program to promote healthy use of free time among middle school adolescents. *Journal of Leisure Research 36*(3), 310-335.

Chatzisarantis, N.L.D. & Hagger, M.S. (2009) Effects of an intervention based on self-determination theory on self-reported leisure-time physical activity participation. *Psychology & Health 24*(1) 29-48. doi: 10.1080/08870440701809533

Cheon, S. H., Reeve, J. & Moon, I. S. (2012). Experimentally based, longitudinally designed, teacher-focused intervention to help physical education teachers be more autonomy supportive toward their students. *Journal of Sport & Exercise Psychology, 34*, 365-396.

Deci, E. L., Eghrari, H., Patrick, B. C. & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality 62*(1), 119-42. doi:10.1111/j.1467-6494.1994.tb00797.x

Deci, E. L. & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York, Plenum.

Deci, E. L. & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. *Nebraska symposium on motivation. Vol 38: Perspectives on motivation*. Dienstbier, R. Lincoln, University of Nebraska Press. 38**:** 237-288.

Deci, E.L., Ryan, R.M. & Williams, G.C. (1996) Need satisfaction and the self-regulation of learning. *Learning and Individual Differences 8*(3), 165-18. DOI: 10.1016/S1041-6080(96)90013-8

Deci, E. L. & Ryan, R. M. (2000). The "What" And "Why" Of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry 11*(4), 227-268. doi:10.1207/S15327965PLI1104_01

Department of Health (2004). *Health Benefits of Physical Activity in Childhood and Adolescence. At least Five a Week: Evidence on the Impact of Physical Activity and its Relationship to Health*. London: Department of Health, 2004.

Furnham, A., Badmin, N. & Sneade, I. (2002). Body image dissatisfaction: Gender differences in eating attitudes, self-esteem, and reasons for exercise. *Journal of Psychology 136*(6), 581-96. doi:10.1080/00223980209604820

Gauvin, L. & Rejeski, W. J. (1993). The exercise-induced feeling inventory - development and initial validation. *Journal of Sport & Exercise Psychology 15*(4), 403-423.

Gillison, F. B., Standage, M. & Skevington, S. M. (2011). Motivation and body-related factors as discriminators of change in adolescents' exercise behavior profiles. *Journal of Adolescent Health 48* (1) 44-51. doi:10.1016/j.jadohealth.2010.05.006

Goudas, M., Biddle, S. & Fox, K. (1994). Perceived locus of causality, goal orientations, and perceived competence in school physical-education classes. *British Journal of Educational Psychology 64*(3), 453-463. doi:10.1111/j.2044-8279.1994.tb01116.x

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality & Social Psychology 52*, 890-898. doi:10.1037/0022-3514.52.5.890

Guay, F., Vallerand, R. J. & Blanchard, C. (2000). On the assessment of situational intrinsic and extrinsic motivation: The situational motivation scale (sims). *Motivation & Emotion 24*(3), 175-213. doi:10.1023/A:1005614228250

Hagger, M. S., Chatzisarantis, N. L., Culverhouse, T. & Biddle, S. (2003). The processes by which perceived autonomy support in physica education promotes leisure-time physical activity intentions and behavior: A trans-contextual model. *Journal of Educational Psychology 95*(4), 784-795. doi:10.1037/0022-0663.95.4.784

Jang, H., Reeve, J. & Deci, E.L. (2010) Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology, 102*(3) 588-600. doi:10.1037/a0019682

Kasser, T. & Ryan, R. M. (1996). Further examining the american dream: Differential correlates of intrinsic and extrinsic goals. *Personality & Social Psychology Bulletin 22,* 280-287. doi:10.1177/0146167296223006

Koestner, R., Ryan, R.M., Bernier, F. & Holt, K. (1984) Setting limits on children's behaviour – The differential effects of controlling vs informational styles on intrinsic motivation and creativity. *Journal of Personality 52*(3), 233-248. doi: 10.1111/j.1467-6494.1984.tb00879.x

Lonsdale, C., Sabiston, C. M., Taylor, I. M. & Ntoumanis, N. (2011) Measuring student motivation for physical education: Examining the psychometric properties of the Perceived Locus of Causality Questionnaire and the Situational Motivation Scale. *Psychology of Sport & Exercise 12*, 284-292. doi: 10.1016/j.psychsport.2010.11.003

Lonsdale, C., Sabiston, C. M., Raedeke, T. D., Ha, A. S., & Sum, R. K. (2009). Self-determined motivation and students' physical activity during structured physical education lessons and free choice periods. *Preventive Medicine, 48*(1), 69-73. doi: 10.1016/j.ypmed.2008.09.013

Mata, J., Silva, M.N., Vieira, P.N., Carraça, E.V., Andrade, A.M., Coutinho, S.R., Sardinha, L.B. & Teixeira, P.J. (2009) Motivational "spill-over" during weight control: Increased self-determination and exercise intrinsic motivation predict eating self-regulation. *Health Psychology, 28*(6) 709-716. doi: 10.1037/a0016764

McAuley, E., Duncan, T. & Tammen, V. V. (1989). Psychometric properties of the intrinsic motivaiton inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise & Sport 60*, 48-58.

Moller, A. C., Deci, E. L. & Ryan, R. M. (2006). Choice and ego-depletion: The moderating role of autonomy. *Personality and Social Psychology Bulletin 32*(8), 1024-1036. doi:10.1177/0146167206288008

Niemiec, C. P., Ryan, R. M. & Deci, E. L. (2009a). The path taken: Consequences of attaining intrinsic and extrinsic aspirations in post-college life. *Journal of Research in Personality 43*(3), 291-306. doi:10.1016/j.jrp.2008.09.001

Niemiec, C. P., Ryan, R. M., Deci, E. L. & Williams, G. C. (2009b). Aspiring to physical health: The role of aspirations for physical health in facilitating long-term tobacco abstinence. *Patient Education & Counseling 74*(2), 250-257. doi:10.1016/j.pec.2008.08.015

Ntoumanis, N. & Standage, M. (2009) Motivation in physical education classes : A self-determination theory perspective. *Theory and Research in Education 7*, 194-202. doi:10.1177/1477878509104324

Papaioannou, A., Bebetsos, E., Theodorakis, Y., Christodoulidis, T. & Kouli, O. (2006). Causal relationships of sport and exercise involvement with goal orientations, perceived competence and intrinsic motivation in physical education: A longitudinal study. *Journal of Sports Sciences 24*(4), 367-382. doi:10.1080/02640410400022060

Pelletier, L. G., Fortier, M. S., Vallerand, R. J. & Briere, N. M. (2001). Associations among perceived autonomy support, forms of self- regulation, and persistence: A prospective study. *Motivation & Emotion 25*(4), 279-306. doi:10.1023/A:1014805132406

Raudenbush, S.W. & Bryk, A.S. (2002). *Hierarchical Linear Models* (Second Edition). Thousand Oaks: Sage Publications.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist 55*(1), 68-78. doi:10.1037/0003-066X.55.1.68

Ryan, R. M. & Deci, E. L. (2006). Self-regulation and the problem of human autonomy: Does psychology need choice, self-determination, and will? *Journal of Personality 74*(6), 1557-1585. doi:10.1111/j.1467-6494.2006.00420.x

Sebire, S. J., Standage, M., & Vansteenkiste, M. (2008). Development and validation of the Goal Content for Exercise Questionnaire. *Journal of Sport & Exercise Psychology, 30*, 353-377.

Sebire, S. J., Standage, M. & Vansteenkiste, M. (2009). Examining intrinsic versus extrinsic exercise goals: Cognitive, affective, and behavioral outcomes. *Journal of Sport & Exercise Psychology 31*, 189-210.

Sebire, S. J., Standage, M., & Vansteenkiste, M. (2011). Predicting objectively assessed exercise behavior from the content and regulation of exercise goals: Evidence for a mediational model. *Journal of Sport & Exercise Psychology 33*(2), 175-198.

Sheldon, K.M. & Filak, V. (2008) Manipulating autonomy, competence and relatedness in a game learning context: New evidence that all three needs matter. *British Journal of Social Psychology, 47*(2) 267-283. doi:10.1348/014466607X238797

Sheldon, K. M., Ryan, R. M., Deci, E. L. & Kasser, T. (2004). The independent effects of goal contents and motives on well-being: It's both what you pursue and why you pursue it.

Personality & Social Psychology Bulletin 30(4), 475-86. doi:10.1177/0146167203261883

Smith, A. L. (2003). Peer relationships in physical activity contexts: A road less traveled in youth sport and exercise psychology research. *Psychology of Sport & Exercise 4*(1),25-39. doi:10.1016/S1469-0292(02)00015-8

Standage, M., Duda, J. L. & Ntoumanis, N. (2003). A model of contextual motivation in physical education: Using constructs from self-determination and achievement goal theories to predict physical activity intentions. *Journal of Educational Psychology 95*(1), 97-110. doi:10.1037/0022-0663.95.1.97

Standage, M., Duda, J. L. & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology 75*(Pt 3), 411-33. doi:10.1348/000709904X22359

Standage, M., Duda, J. L. & Ntoumanis, N. (2006). Students' motivational processes and their relationship to teacher ratings in school physical education: A self-determination theory approach. *Research Quarterly for Exercise and Sport 77*(1), 100-10.

Standage, M., Duda, J. L. & Pensgaard, A. M. (2005). The effect of competitive outcome and task-involving, ego-involving, and cooperative structures on the psychological well-being of individuals engaged in a co-ordination task: A self-determination approach. *Motivation & Emotion 29*(1), 41-68. doi:10.1007/s11031-005-4415-z

Standage, M., Gillison, F. & Treasure, D. (2007). Self-determination and motivation in physical education. *Self-determination theory in sport and exercise.* Hagger, M. and Chatzisarantis, N. Champaign IL, Human Kinetics.

Standage, M., & Ryan, R.M. (2012). Self-determination theory and exercise motivation: Facilitating self-regulatory processes to support and maintain health and well-being. In

G.C. Roberts & D.C. Treasure (Eds.), *Advances in motivation in sport and exercise - 3rd edition* (pp. 233-270). Champaign, IL: Human Kinetics.

Standage, M., Treasure, D.C., Duda, J.L., & Prusak, K.A. (2003). Validity, reliability, and invariance of the situational motivation scale (SIMS) across diverse physical activity contexts. *Journal of Sport & Exercise Psychology, 25*, 19-43.

Taylor, I.M. & Lonsdale, C. (2010) Cultural Differences in the Relationships Among Autonomy Support, Psychological Need Satisfaction, Subjective Vitality, and Effort in British and Chinese Physical Education. *Journal of Sport & Exercise Psychology, 32*(5), 655-673. doi:10.1037/0022-0663.99.4.747

Taylor, I.M. & Ntoumanis, N. (2007) Teacher motivational strategies and student self-determination in physical education. *Journal of Educational Psychology* 99(4), 747-760. doi:10.1016/j.psychsport.2008.09.002

Taylor, I.M., Ntoumanis, N. & Smith, B. (2009) The social context as a determinant of teacher motivational strategies in physical education. *Psychology of Sport & Exercise 10*(2), 235-243. doi:10.1016/j.psychsport.2008.09.002

Tessier, D., Sarrazin, P & Ntoumanis, N. (2010) The effect of an intervention to improve newly qualified teachers' interpersonal style, students motivation and psychological need satisfaction in sport-based physical education. *Contemporary Educational Psychology 35*(4), 242-253. doi:10.1016/j.cedpsych.2010.05.005

Vallerand, R. J. (1997). A hierarchical model of intrinsic and extrinsic motivation in sport and exercise. *Advances in Experimental Social Psychology*. M.P., Z. New York, Academic Press.**:** 263-319.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. A. & Deci, E. L. (2004a). Motivating learning, performance, and persistence: The synergistic effects of intrinsic goal contents

and autonomy- supportive contexts. *Journal of Personality & Social Psychology, 87*(2), 246-260. doi:10.1037/0022-3514.87.2.246

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., & Matos, L. (2005). Examining the motivational impact of intrinsic versus extrinsic goal framing and autonomy-supportive versus internally controlling communication style on early adolescents' academic achievement. *Child Development, 76,* 483-501. doi:10.1111/j.1467-8624.2005.00858.x

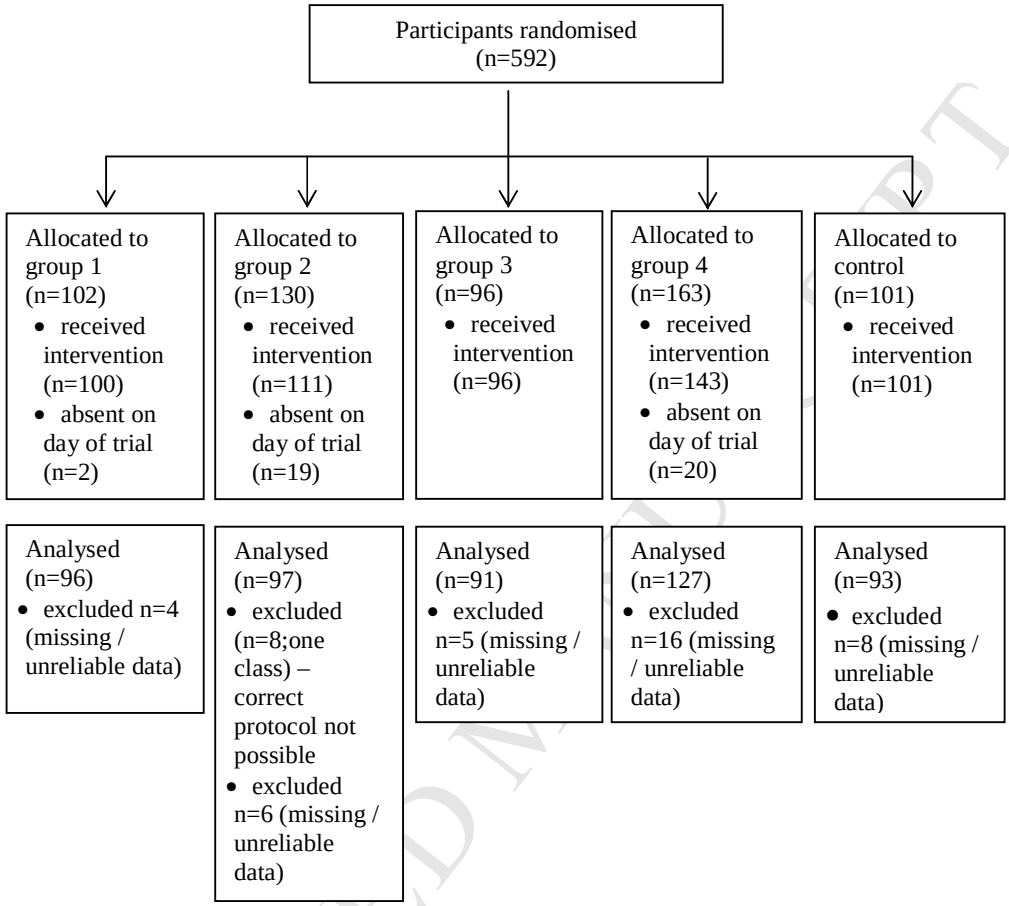
Vansteenkiste, M., Simons, J., Soenens, B. & Lens, W. (2004b). How to become a persevering exerciser? Providing a clear, future intrinsic goal in an autonomy-supportive way. *Journal of Sport & Exercise Psychology, 26*(2), 232-249.

Vlachopoulos, S., Biddle, S. & Fox, K (1996) A social-cognitive investigation into the mechanisms of affect generation in children's physical activity. *Journal of Sport & Exercise Psychology 18*(2), 174-193.

Williams, G. C. McGregor, H. A., Sharp, D., Levesque, C., Kouides, R.W., Ryan, R. M., Deci, E. L.(2006) Testing a self-determination theory intervention for motivating tobacco cessation: Supporting autonomy and competence in a clinical trial. *Health Psychology, 25*(1), 91-101. doi: 10.1037/0278-6133.25.1.91

Wang, C.K.J., Liu, W.C., Lochbaum, M.R., & Stevenson S.J. (2009) Sport Ability Beliefs, 2 x 2 Achievement Goals, and Intrinsic Motivation: The Moderating Role of Perceived Competence in Sport and Exercise. *Research Quarterly for Exercise & Sport 80*(2), 303-312.

Figure 1: Consort flow diagram of progress through the trial



Key; Group 1 = autonomy supportive (AS) & intrinsic goal (IG); Group 2 = controlling (C) & IG; Group 3 = AS & extrinsic goal (EG); Group 4 = C & EG. * only

Table 1 Group level perceptions of lesson climate (manipulation check)

	Mean rating (SD)					Between Group Difference
Experimental Group	1	2	3	4	5	
	AS, IG	C, IG	AS, EG	C, EG	control	
Perceived intrinsic goal (α = .82)	5.05[a] (1.16)	4.51[b] (1.56)	4.86[ab] (1.30)	5.36[ab] (1.24)	4.71[a] (1.32)	F(4,447) = 6.03***
Perceived extrinsic goal (α = .90)	4.18[a] (1.56)	3.63[b] (1.56)	4.85[ac] (1.51)	5.15[c] (1.40)	4.05[ab] (1.64)	F(4, 444) = 15.74***
No goal (α = .72)	2.98[a] (1.19)	3.09[a] (1.28)	3.16[a] (1.38)	2.89[a] (1.38)	3.32[a] (1.36)	F(4, 399) = 0.93
Perceived autonomy-support (α = .90)	4.23[ab] (1.31)	3.70[a] (1.18)	4.56[b] (1.18)	3.85[a] (1.27)	3.92[a] (1.35)	F(4, 487) = 7.05***

AS =autonomy-support, C=controlling, IG=intrinsic (health) goal content, EG= extrinsic (weight and appearance) goal content; post hoc tests: conditions with the same superscript are not statistically different (i.e., have a similar mean value); * $p<.05$, ** $p<.01$, *** $p<.001$

Table 2: Comparison of mean values for study outcomes across groups

Outcomes	Intrinsic goal content		Extrinsic goal content		Neutral	Differences between groups (post hoc tests)	
	Autonomy supportive (ASIG) (k=6, n=101)	Controlling (CIG) (k=6, n=111)	Autonomy supportive (ASEG) (k=5, n=95)	Controlling (CEG) (k=6, n=141)	No goal (k=3, n=99)	ANCOVA (controlling for contextual motivation)	Effect size (partial eta square)
Motivation[±]	7.38 (10.97)[abc]	5. 18 (11.52)[ab]	9.61 (10.82)[ac]	9.48 (11.50)[ab]	6.17 (13.55)[abc]	F(5,472) =23.23***	.20
Effort (α = .80)	4.88 (1.25) [ce]	4.95 (1.17) [ab d]	4.77 (1.32) [ce]	5.35 (1.22) [abd]	5.20 (1.26)	F(5,472) = 15.84***	.14
Enjoyment (α = .92)	4.22 (1.51)	4.10 (1.24)	4.20 (1.29)	4.47 (1.37)	4.28 (1.66)	F(5,411) =16.22***	.15
Intention	3.79 (1.66) [e]	3.95 (1.88)	3.86 (1.75) [e]	4.44 (2.07) [b d]	3.82 (2.08)	F(5,411) = 9.20***	.10
Value (α = .95)	4.43 (1.60) [e]	4.33 (1.56)	4.42 (1.59)	5.02 (1.57) [ab]	4.38 (1.80)	F(5,472) =17.02***	.15
Affect (α = .78)	1.87 (.66)	1.92 (.67)	1.91 (.62)	1.84 (.71)[c]	1.93 (.71)	F(5,411) =20.30***	.18

*** $p<.001$; [±] Cronbach's α is only meaningful for subscales of motivational regulations: intrinsic motivation α = .91, identified regulation α = .88, introjected regulation α = .79, external regulation α = .76, amotivation α = .83; post hoc tests: conditions with the same superscript are not statistically different (i.e., have a similar mean value)

Table 3: Outcome of Hierarchical Linear Modelling analysis demonstrating multi-level outcomes

		Level 2 Effects (T-ratio; *df* = 19)					Level 1 effects (T-ratio; *df* = 471)	
	ICC	Intercept[±]	Group	Size	Time	Sex	Usual AS	Contextual motivation
Motivation	0.06	6.32	0.90	.13	-.86	.51	1.71	.39
		(1.80)	(1.59)	(.92)	(-.58)	(.31)	(3.2) **	(6.31)***
Effort	0.04	2.30	.07	.02	-.28	.04	.17	.04
		(21.30)***	(1.84)	(1.92)	(-2.69)*	(.39)	(2.99)**	(5.33)***
Enjoyment	0.03	4.55	.05	.02	-.07	-.21	.27	.03
		(14.34)***	(1.07)	(1.84)	(-.50)	(-1.50)	(4.34)***	(4.36)***
Intention	0.01	3.94	18	.02	-.26	.15	.24	.04
		(9.80)***	(2.85)*	(.92)	(-1.57)	(.84)	(2.46)*	(3.61)**
Value	0.04	4.56	.15	.03	-.21	.01	.27	.04
		(12.56)***	(2.61)*	(1.80)	(-1.45)	(.09)	(3.52)**	(4.79)***
Affect	0.04	14.071	-.02	.00	-.10	-.18	.12	.02
		(.17)	(-.64)	(.43)	(-1.4)	(-2.34)*	(3.71)***	(5.08)***

* p<.05, **p<.005, ***p<.001; [±] The intercept represents the value of the dependent variable for participants in control (neutral climate, goal-content free) conditions, subsequent columns indicate variation from this value attributable to experimental condition (for Level 2 variables) or individual differences (for Level 1 variables). T-ratios indicate the significance of effects.

Table 4 Standardized β coefficients of *post-hoc* individual level regression analysis

	Motivation	Effort	Enjoyment	Intention	Value	Affect [a]
Contextual autonomy support for PE	-.014	.036	-.011	-.034	.019	.051
Baseline (contextual) motivation	.225***	.266***	.180***	.186**	.168***	-.031
Perceived health focus	.356***	.373***	.428***	.341***	.488***	.189**
Perceived weight-control/appearance focus	.012	-.021	.001	.052	.041	-.105
Rationale/goal not provided	-.217***	-.094*	-.037	-.109*	-.122**	.040
Perceived autonomy support of lesson	.306***	.096*	.253***	.175**	.149***	.079
R^2	.75	.61	.68	.36	.72	.46

* p<.05, **p<.005, ***p<.001; [a] – pre-lesson affect was entered into the regression equation as part of the first step, and was a significant predictor in the equation beta = .36**